

masses which he has called "system clouds" form huge layers, generally discontinuous (at least at their borders), where the undulations may be distinctly observed.

The clouds show us the long waves which must necessarily be formed between two layers of air sliding one over the other and between which clouds are interposed.

However, Dobrowolski's work should be continued, and the only way to bring it to a satisfactory end and to resolve the fine problems of atmospheric dynamics which are still awaiting a definite solution is to have good observers distributed at a series of stations sufficiently close together so that the same system of clouds might be studied simultaneously through its whole extent. If we look forward into the question of the scientific exploration of the Antarctic regions the idea of an international cooperation, of the concentration of all efforts toward one and the same end, this idea must necessarily pursue us.

The Cape Horn region and the lands situated farther south seem to me very favorable for the establishment of a polygon of stations, the chosen places being Falkland Islands, Staten Island, one of the islands of Diego Ramirez, and the lighthouse of Los Evangelistas; then the South Georgia, Sandwich, Orkney, and South Shetland islands; lastly, a station on the coast of Graham Land, another at the wintering station of Nordenskjöld, for example, and two floating stations—one in the region of the drift of the *Belgica* and the other in the Weddell Sea. We would have in this way a polygon of posts of observation sufficiently large, and composed at the same time of points sufficiently near together.

The expenses of such an undertaking might be counted as follows:

A ship wintering in the ice in the region of the drift of the *Belgica*, \$100,000.

A second ship in Weddell Sea, \$100,000; a third, exploring the edge of the pack and studying the variations of the distributions of the ice and making oceanographic researches during the whole year, \$100,000.

The first and second may install each a station on the Antarctic lands, and the third, in two cruises, the four stations on Sandwich, Georgia, Falkland, and Shetland islands—let us count six stations at \$30,000 each.

And, lastly, as for the region of Cape Horn, there is already a good meteorological station on the Island Año Nuevo, near Staten Island, while that one of the lighthouse of Los Evangelistas would probably need a special staff and instruments, and so let us simply count Diego Ramirez, \$20,000, and a mountain station, for example, on the summit of the mountain called Bonnet de la République, near Llopoiaia, the installation and all the working expenses of which would not exceed \$30,000.

The entire expenses of such an undertaking, then, would not, as you see, exceed \$530,000.

If you will bear in mind that this expense would be divided between the different nations taking part in this expedition, and that, aside from the meteorological work, other researches, oceanographic, etc., would certainly be undertaken, you will see that the proposition which I submit could be easily realized, and that our knowledge of the physical conditions of the globe would be enriched by an enormous amount of new scientific data, for the acquisition of which it is worth while to sacrifice the money and necessary efforts.

DEFLECTION OF THUNDERSTORMS WITH THE TIDES.

CAPE MAY COURT HOUSE, N. J., November 9, 1904.

Prof. WILLIS L. MOORE,

Chief of U. S. Weather Bureau, Washington, D. C.

SIR: In the August issue of the MONTHLY WEATHER REVIEW, I note, with interest, an article from Mr. George L. Lovett, of Cape May, N. J., regarding the deflection of thunderstorms by the tides as they pass up and down the Delaware Bay.

I wish to concur with him as to the facts as stated, from several years' observation.

It is a common occurrence, during the summer months, to witness heavy cumulo-stratus clouds passing up the bay with the rising tide, and down the bay with the falling tide, but more frequently do they pass up. At Cape May Court House, N. J., which is twelve miles from Cape May and about three miles west of the ocean, it is seldom we have a thunderstorm simultaneously with a falling tide, but usually with the beginning or on top of the flood tide. If, as occasionally occurs, a storm comes on the ebb tide, it is generally heavy and accompanied with dangerous lightning and heavy winds. It is the invariable practise of our baymen, on observing a "squall rising" as they term it, during the ebb tide, to seek shelter before the flood tide makes, when they look for the storm to break forth.

Another phenomenon is, that thunderstorms more frequently either follow the Delaware Bay or cross the cape in close proximity to the Tuckahoe River basin.

Cape May Court House is nearly midway between Cape May on the south and the Tuckahoe River on the north. Now, on the ebb tide, when storms are passing down the Delaware, they are liable to either cross the cape in the vicinity of Woodbine and pass down the Tuckahoe River basin, with the tide to the ocean, and on the flood tide from the ocean across the cape to the bay, or pass down the Delaware past Cape May, thus avoiding a belt across Cape May County, with Cape May Court House as the center.

This is evident by the following normal annual precipitation as given in the annual report of the New Jersey Weather Service: Ocean City, 1900, 43.94 inches; Atlantic City, 1903, 43.71 inches; Woodbine, 1903, 43.68 inches; Cape May, 1903, 43.88 inches, and Cape May Court House, 1903, 41.13 inches.¹

From these figures it will be observed that Ocean City, situated near the mouth of the Tuckahoe River, receives a larger rainfall than either Atlantic City at the north or Woodbine or Cape May Court House at the south; that Woodbine, being situated farther from the river, receives less rainfall; that Cape May situated at the cape receives a large rainfall, and that Cape May Court House, being in the center of the belt, receives the least rainfall. On investigation of the reports it will be found the difference is noted during the summer months, or during the thunderstorm period, thus showing that the thunderstorms follow the rivers with the tides.

Yours, very respectfully,

L. T. GARRETSON,
Voluntary Observer.

WEATHER BUREAU RECORDS.

By virtue of Instructions No. 210, dated December 16, 1904, a number of changes will be made in the forms and records, which must be carefully considered by those of our colleagues throughout the world who are studying Weather Bureau data. Perhaps the most troublesome change is that depending on the adoption of local standard hour meridians instead of the uniform seventy-fifth meridian time that has been so convenient for meteorological, magnetic, and seismic work. We make the following extracts from the report of the board on the revision of forms, which report goes into effect January 1, 1905:

1. The adoption of a form to be known as the Daily Local Record. * * * This form provides for the entry of the hourly temperature readings; the hourly amounts of precipitation, with the time of beginnings and endings; the hourly sunshine; the hourly wind direction and velocity, and the hourly maximum wind velocities when above a certain limit, which limit will vary for the different stations. It also provides for entering the character of the day, the total sunshine in hours, prevailing wind direction, and other data; and a diagram is provided on which the daily temperature and pressure curves may be plotted, if desired. Space is also provided for the entry of abnormal conditions, severe storms, and other matter not expressed by the instrumental readings. An extra horizontal column, without heading, has been provided for the entry of data of excessive precipitation, now recorded on the back of Form 1017-Met'l, or other data, a record of which may be of sufficient importance to retain at the station. In short, it has been the aim to embody in the Daily Local Record form a complete history of the weather of the day. * * *

2. In the matter of compiling the hourly readings of the various instruments the board is of the opinion that sufficient compilations of the hourly barograph readings have been made, and it therefore recommends that Form 1026-Met'l, Barograph, be discontinued on December 31, 1904, at all stations now rendering said form. In regard to temperature the board is of the opinion that this element, aside from its purely climatic value, has sufficient public interest to warrant the tabulation of hourly values, as at present, but after tabulations are made and means found for a period of twenty years no further sums and means of the daily and hourly values need be made.

The hourly records of wind direction and movement are important, especially to Lake and sea-coast stations, and at some points in the interior. Since frequent changes in the exposure of wind instruments have been made in the past, and since it is probable that such changes will continue to be made in the future, the matter of determining monthly and seasonal normals becomes exceedingly difficult. Each exposure of the anemometer forms, in itself, a separate and distinct record, and should be treated as such. Unless a series of comparative readings are made between the old and new exposures a combination of the two series in a general mean is not satisfactory. Therefore, when a removal is to be made, a series of comparative readings, extending over at least a year, should be made whenever practicable. It is believed that these data should continue to be tabulated as at present. At those stations where an undisturbed and continuous exposure has been had for a period of ten or fifteen years, it is quite probable that fairly accurate normals could be obtained, and those stations might be authorized to cease computing sums and means.

3. Form 1001-Met'l. The board recommends the adoption of a new Form 1001-Met'l. * * * The new form retains pages 2, 3, 6, and 8 of

¹ These normals are based on the following length of record: Ocean City, eleven years; Atlantic City, twenty-seven years; Woodbine, eleven years; Cape May Court House, fifteen years. The normals are therefore not comparable with one another.—F. O. S.

the present form substantially as they are. These pages, it may be remembered, provide for the 8 o'clock and special observations. The last-named page has been brought forward and takes the place of the instructions which now stand on page 4 of the present form. Page 5 of the present form, "Wind, number of miles and length of time from," has been stricken from the new form.

The board recommends that no further compilation be made of the data now recorded on page 5, Form 1001-Met'l, after December 31, 1904. The new form contains four additional pages on which it is proposed to enter the hourly temperatures, the hourly wind directions and velocities, and the hourly sunshine. These four pages replace the present Forms 1026-Met'l, Thermograph; 1021 Met'l, Hourly Wind Direction; 1022 Met'l, Hourly Wind Velocity, and 1070-Met'l, Hourly Sunshine. In other words the board has consolidated with Form 1001-Met'l four additional forms, and has thus brought together, in compact shape, information that is now carried on four different papers. The board desires to invite attention to the fact that the adoption of the above recommendations obviates the necessity of press copying the forms just mentioned.

The copy of Form 1001-Met'l retained at station will contain only a record of the observations at 8 a. m. and 8 p. m. (seventy-fifth meridian time), the special observations, and the summary of temperature and precipitation on page 8, except that the beginnings and endings of rainfall will not be entered on the last-named page. The beginnings and endings of rainfall will appear on the Central Office copy, however, in seventy-fifth meridian time, and the total precipitation there given will be for the period midnight to midnight, local standard time.

6. The board recommends that all instrumental records and the Daily Local Record be kept on *local standard time*, but that all data intended for the Central Office shall be recorded on seventy-fifth meridian time, except that the hourly temperature, the hourly records of wind velocity and direction, and the hourly sunshine shall be entered on local standard time.

7. The board recommends the discontinuance of the present form of Daily Journal and the substitution therefor of * * * a report to contain a description of unusual or remarkable atmospheric phenomena that have been observed during the month, and any matters that seem to call for special mention. It is not the intention that entries shall be made for each and every day of the month, but rather that a succinct narrative be given of the important events of the month, such as the occurrence of severe storms, cold waves, thunderstorms, or the prevalence of abnormal conditions extending over several days. It is believed that a copy of the notes made for the Daily Local Record will, as a rule, meet the requirements of the Central Office. This shall be known as the Monthly Meteorological Report.

8. The board recommends that the following data be no longer recorded:

(1). Extreme wind velocity. This information is of doubtful value. It must always be accompanied by a statement of how it was obtained, and it is liable to be confused with maximum velocities for five-minute periods; moreover when high velocities are attained it is difficult to accurately read them from the wind sheets.

(2). Number of days with mean temperature below 14° and 32°, and above 41°, 50°, 59°, 68°, 77°, and 90°, as recorded in the summary of Form 1001-Met'l, Form 1002-Met'l, and the Means Book. These data have been compiled for a number of years. They have not yet been used, so far as known to the board, in any manner. They can be obtained, if desired, from other records, and it is therefore believed that time and space can be saved by discontinuing their further compilation.

10. The board recommends that the present Means Book be known, hereafter, as the Climatological Record. It further recommends that the manner of entering the data therein, or the form of the volume, be changed as follows: Instead of entering the several elements for each month consecutively on seven pages, as at present, let them be grouped under several general heads, as Pressure, Temperature, Precipitation, etc., according to the character of the data, and entered separately.

Finally, the board believes that the Climatological Record should contain the following data:

Pressure (reduced to sea level).—Highest; lowest; mean; absolute monthly range.

Temperature.—Monthly mean, departure from the normal; mean monthly maximum and mean monthly minimum; absolute monthly minimum and date; absolute monthly maximum and date; mean daily range; greatest daily range; absolute monthly range; mean monthly variability; lowest monthly maximum; highest monthly minimum; number of days with maximum 32°, or below, and 90°, or above; minimum 32°, or below, and zero, or below.

Relative humidity.—Mean a. m. and p. m.

Precipitation.—Total amount for the month, departure from normal; greatest amount in twenty-four hours, amount and date; one inch an hour or over, total amount and date; 2.50 inches in twenty-four hours, amount and date; number of days with .01 inch and over, .04 and over, .25 or more, 1.00 or more; total depth of snowfall; number of days with

snow; snow on ground at end of month; greatest snowfall in twenty-four hours; greatest depth of snow on ground and date.

Wind.—Total movement; prevailing direction; average hourly velocity; maximum velocity, direction, and date.

Weather.—Actual hours of sunshine, percentage; average cloudiness, a. m. and p. m.; number of days clear, partly cloudy, cloudy; number of days with fog or hail; thunderstorms; auroras; solar halos; lunar halos.

Daily and hourly data.—Daily maximum, minimum, and mean temperature; daily precipitation; daily snowfall; hourly values of pressure, temperature, wind, and sunshine.

Before closing this report the board desires to urge the importance of devising some method of recording the cloudiness at night and the beginnings and endings of light precipitation. The board recognizes the very great importance to stations of retained copies of the wind sheets, Form 1017-Met'l. It is understood that as yet no means have been devised whereby such copies can be had. The hope is expressed that the Instrument Division of the Central Office may be able to take up the problem and eventually solve it.

WEATHER BUREAU MEN AS INSTRUCTORS.

Prof. H. J. Cox, Chicago, Ill., delivered an address upon Recent Advances in Meteorology before the earth science section of the Central Association of Science and Mathematics Teachers at its fourth annual convention, held in Chicago, November 28.

Mr. H. W. Richardson, Local Forecaster, Duluth, Minn., reports that a class of about twenty students from the Blaine High School of Superior, Wis., visited the Weather Bureau office at Duluth on November 21. After showing the visitors the instrumental equipment, Mr. Richardson gave them a somewhat extended, though informal, lecture upon the general work and methods of the Weather Bureau.

Mr. J. P. Bolton, Observer, Fresno, Cal., lectured on November 28 to the physical geography class of the Fresno High School.

Mr. E. C. Vose, Section Director, Parkersburg, W. Va., is conducting a course of study in practical meteorology for the class in physical geography of the local high school. The study began early in November, and forty minutes each week are devoted to the work.

Mr. George T. Todd, Observer, Wichita, Kans., on November 17 and 18, 1904, addressed the high school class in physical geography, which came to the office in two sections. The instruction consisted of an explanation of the instruments, weather maps, and charts, the value of the records, and some remarks on weather forecasting.

ASSMANN'S SOUNDING BALLOONS AT THE ST. LOUIS EXPOSITION.

It is generally known that some years ago the Weather Bureau prepared to undertake a series of balloon ascensions to great heights from some point in the interior of the continent, but that owing to a change of plan the Bureau is now preparing to make these ascensions first from Mount Weather.

Meanwhile the aeronauts of the German meteorological office brought to this country for exhibition a very complete collection of balloon apparatus, and with this apparatus the officials of the Blue Hill Observatory have made a number of soundings from the grounds of the World's Fair at St. Louis. Four balloons were sent up in September, reaching altitudes of nine or ten miles, and all of the records were secured. The balloons are what are called Assmann's expansible and exploding balloons. They are made of thin India rubber, about a yard in diameter, and burst when the pressure of the gas inside, relative to that on the outside, has distended the balloon sufficiently to burst it. The balloon being free is carried hori-